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II.—*The Physical Geography and Climate of the Colony of Natal.*

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Read, November 26, 1866.

THE Colony of Natal lies on the Eastern Coast of South Africa. It is about 800 miles beyond the Cape of Good Hope, and is included between the 27th and 31st parallels of south latitude. It is a small land, having an area not exceeding one-third the area of England; but it occupies a very important and interesting position as being the focus and centre, and therefore the type, of what Dr. Livingstone, and others, have termed "the Kaffir zone" of South African climate.* It has a sea-coast of 150 miles trending from south-west to north-east, and looking out into the Indian Ocean. The lower, or southern, half of this coast has a range of mountains lying parallel to it at a distance of about 100 miles, and thus forming the opposite or inland frontier of the colony. Further north this mountain frontier bends back into a kind of hollow bay, with a sharp *angular* extremity, which is 40 miles further from the sea. The so-called mountains are, however, properly a ledge, or step, rather than a ridge. They are the first abrupt descent by which the main central table-land of the great continent subsides towards the sea-border. The face of the step, looking towards the colony, is a bold and buttressed wall several hundred feet high; whilst, on the other side, the abrupt barrier makes a very trifling dip to the high plains of Basuto-land and the Orange River Free States. The crest of this ledge is generally between 5000 and 6000 feet above the sea; but its higher peaks and jags rise to between 7000 and 9500 feet. The extreme northern corner of the colony, where the Buffalo River comes out from the inland mountain frontier, is within about 200 miles of the southern tropic. The entire land is therefore sub-tropical;—that is to say, it possesses the leading characters of a tropical climate in a subdued and pleasantly softened degree. In actual size the colony comprises 17,000 square miles; or, in other words, 11,000,000 of acres of land.

From the salient point of the Drakenberg Mountains, where the barrier begins to retire to form the bay already described, there comes forth a subordinate mountain ridge, which crosses the middle of the colony as a high central back-bone, stretching north-eastward until it almost strikes the *river* frontier in that

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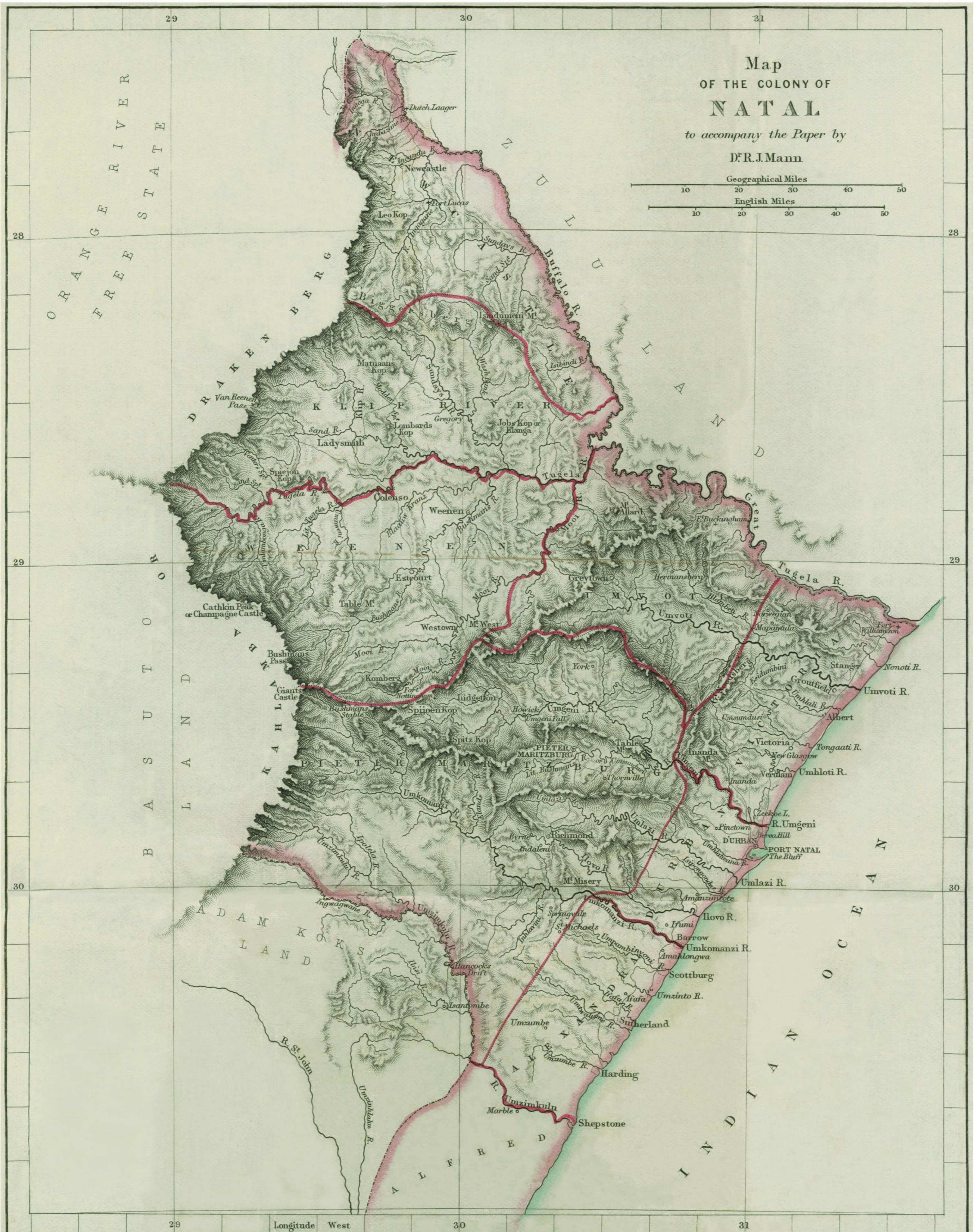
* See Wilson's Paper on "Water Supply in the Basin of the Orange River," 'Journal,' vol. xxxv. p. 106.



Map
OF THE COLONY OF
NATAL
to accompany the Paper by
Dr. R. J. Mann

Edwd. Weller

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direction. This ridge is fingered towards the sea, and between the fingers separate rivers drain down. There are five fingers, and there are four main grooves or rivers, which are respectively known as the Umvoti, the Umgeni, the Umlazi, and the Ilovo. The extremities of the fingers are also split into yet smaller cracks, out of which issue thirteen other lesser rivers. Further south a somewhat similar state of things is continued; but the main ridges there come direct from the Drakenberg, instead of from a central secondary offset. The chief ridges in this direction lie between the Umkomangi, Umzimkulu, and Umtamfume rivers; but there are also subordinate fingers, and subordinate streams, so that there are altogether about fifty distinct rivers, large and small, opening out each by a separate mouth along the 150 miles of coast. The traveller who rides along the land near to the coast is always either climbing up out of a water-course or descending into one.

The coast is everywhere comparatively low. There the hills range from one to three or four hundred feet in height. On the sides of these hills, and in the valleys lying between, sugar, coffee, arrowroot, and most other plants of tropical habit and constitution, grow and thrive. The coast counties of Victoria, Durban, and Alexandra, are now the seats of considerable industrial activity. There are now sixty-three sugar-mills in operation in this district; and the year before last there were produced in it 7000 tons of sugar, 62,000 pounds of coffee, and 115 tons of arrowroot. In leaving the coast the ridges of the land rise higher and higher, until at the distance of 70 miles from the sea, on the great central back-bone already alluded to, the main road lies 5400 feet, or rather more than one mile, high; and the summits of the surrounding hills have a still loftier elevation. In climbing this slope, the tract where sugar and coffee can be grown, and where the pine-apple and banana ripen, is left at a distance of about 16 miles from the sea; and a region of green hilly pastures is entered upon, where cattle and horses thrive, and where wheat and oats, the potato, and many of the food-crops of Europe, can be advantageously cultivated. On the tops of the hills of the central districts sheep are now becoming abundant, and doing exceedingly well. In the year before last there were in Natal, in round numbers, 290,000 head of cattle, 170,000 sheep, and 15,000 horses. In order that the correct meaning of these numbers may be apprehended, it must be understood that the land has only been an European settlement forty years, and a British dependency twenty years.

Indian corn and tobacco grow everywhere, both on the coast lands and in the uplands, in the utmost luxuriance.

The northern division of the colony, which lies beyond the great central back-bone, whence descend the five fingers and four rivers, is one broad watershed or basin, coming out from the retiring bay of the Drakenberg already alluded to, and having its streams all gathered together at the north-eastern frontier of the colony into one common outlet or channel, which thence runs through a course of about 70 miles to the sea, and is known as the Great Tugela River; a frontier river all the way. The central branch of these upper tributaries of the Great Tugela is still called the Tugela, and comes out from the notch of the retiring angle or bay of the Drakenberg, by a single bold leap of more than 2000 feet perpendicular height. The other tributary branches of this water-system are the Mooi River, which collects from the south along the northern slope of the great central back-bone and the Buffalo River, which collects from the north and is there the frontier of the colony in upward continuation of the Great Tugela. This northern district is thus a rhomboid space, included between a western mountain-fork and an eastern river-fork which touch at their divergent points; and this space contains the so-called Upland Counties of Weenen, Klip River, and Newcastle. The river confluents which lie between the Northern Buffalo and Central Channel are the Sunday and the Klip rivers. The confluents which lie between the Southern Mooi River and the main channel are the Bushman, the Blau Kranz, and the Little Tugela rivers. Thus, then, in advancing inland in Natal from the coast, along the main line of road, the traveller, who has climbed for 70 miles, dips down into a broad basin, and does not ascend so high again until, after passing all the confluents of this river-system, he mounts the actual wall of the Drakenberg. The hills in this broad valley are high toward the Drakenberg, and resemble the more elevated grounds of the central back-bone: towards the confluence of the rivers the valleys are comparatively low, bush-encumbered and warm. This is so much the case that at Weenen, down towards the mouth of the Bushman's River, and 70 miles to the north of Maritzburg, the orange ripens as perfectly and as readily as it does on the coast.

A very interesting feature of physical geography is involved in the contrasted characters of these two several divisions of the colony of Natal,—the Northern one-river basin, and the Central many-river basin. The first, it will be remembered, issues from the great retiring angle of the Drakenberg frontier; the other hangs upon the great salient angle of the Drakenberg, which it may be here stated stands boldly out into the colony as a buttressed and battlemented mass, and is widely known as a prominent object in the landscape under the name of "The

Giant's Castle." The distribution and disposition of the Drakenberg is indeed the obvious cause of the contrast. The inward fold of the Drakenberg, in the region of the retiring angle or bay, has caused all secondary disturbance and ridges to converge towards a common point or focal centre, where gaps just large enough for the escape of the waters of the basin-area have been left or worn. The backward bend of the Drakenberg, on the other hand, has caused the secondary disturbance and ridges to *ray-out* from the salient point like the fingers of a hand or the sticks of a fan. Where the great mountain-line folds in, the watershed is convergent and the river-system one-mouthed. Where the great mountain-line bends back, the watershed is divergent and expansive, and the river-system many-mouthed. Natal is properly but the narrow rim of the great African table, irregularly bevelled towards the sea. The general plan of the carving of this rim is ribs running outwards with water draining down to the sea between the ribs. But in one place the rim itself has been contorted into a zigzag, and there the ribs have been squeezed convergently in the hollow of the contortion, and expanded radiantly from the prominent points. Hence Natal has its great northern basin of the Tugela, draining nearly one-third of the area of the colony into one vast river; and its coast district fringed by fifty distinct streams, which drain the other two-thirds.

The central high back-bone of the colony lies in the fine pastoral and agricultural counties of Maritzburg and the Umvoti. The coast portion of the fingers of this back-bone composes the counties of Victoria and Durban. The southern district, which lies beyond the fingers of the central highland, and which may be spoken of as the third division of the colony, contains the coast county of Alexandra, and the least-settled portion of Maritzburg County, that which is beyond the Umkomangi River, a district that before long will have to be erected into a distinct county. Until within the last few months the large River Umzimkulu, a Drakenberg-fed stream, was the ultimate boundary of the colony towards the south-west. But now a coast-strip beyond, which was a portion of the territory formerly known as No-man's-land, has been annexed to the colony under the style and title of Alfred County, and the frontier on the coast has been pushed on to the Umtamfume River, the streams feeding the Umzimkulu still remaining the frontier in the higher region. The upper part of this No-man's-land district is held by the Griquas of Adam Kok, who has settled there under the patronage of Her Majesty's High Commissioner.

Throughout the colony, the main ridges of the land, whether comprised within the great one-river basin, or forming part of the still larger many-rivered system, are all subdivided and branched again and again. The land is everywhere, indeed, one vast maze of rolling and divaricated hills, with countless ravines and water-streams running between. These hills are higher, and covered with open green pasture, towards the central back-bone and towards the mountains; and they are lower, and for the most part bush-covered, towards the sea. By following the windings and intricacies of these ridges it is possible to go from the sea to the mountains, almost anywhere along the actual crest of a watershed, without crossing a single stream; this indeed is what the old Dutch Boers, the pioneers of the land, have really done with their main lines of roads. In every other direction the traveller is continually crossing water-courses, much as he does in moving parallel to the coast near the sea. In the uplands the highest tops of the mountains, and the boldest ravines which descend from them, are filled with a growth of evergreen timber-trees. The broader valleys are in many places covered with a thin sprinkling of thorny mimosas of small size. Much of the scenery of the uplands resembles the high moor scenery of Devonshire, with the principal exception that the land is much more brilliant from luxuriant green pasture during two-thirds of the year, and that its irregularities are on a grander scale. Much of the river scenery of the coast bears an equally striking resemblance to some of the finest dales of Derbyshire.

On account of the steep gradient of the land, already alluded to, the rivers of Natal are nearly everywhere turbulent and rapid. They rustle along through channels encumbered with large boulders of granite or trap, or pavemented with irregular and broken slabs of grey sandstone; ever and anon leaping two or three hundred feet from the top of some laminated wall, or columned precipice, into deep pools, and then coursing along through gullies and ravines picturesquely walled by sandstone, that is ornamented by clusters of aloes and candelabra spurges, or by a drapery of evergreens. The rivers are so broken by waterfalls and rapids that they are nowhere navigable excepting by boats through short stretches. Within an easy day's ride of the city of Maritzburg there are several magnificent waterfalls that would make the fortune of any place in England. One of these, only 16 miles from the city, on the river Umgeni, is within a foot of twice the height of Niagara. The river leaps from a wall of columnar basalt, notched in by the fall into a deep ravine that has been cut into trap for a considerable distance. Most of the rivers are encumbered by bars of sand crossing their mouths, that are only broken through at periods of flood, and their mouths are by this agency expanded into broad and deep lagoons, filled with water that is often brackish from the breaking of the sea at high tide over the sand-bars. The larger rivers, the Tugela, Umgeni, Umkomangi, and Umzimkulu, are open at all seasons, with partial sand-bars, but with water-channels large and deep enough for the passage of boats of a few tons' burthen. But the mouths of the channels are intricate and rock-encumbered. A small steam-boat has been taken into the Umkomangi, and some slight works have been undertaken to improve the entrance of this river.

The green hills of Natal are nearly everywhere moulded in granite, trap, or sandstone. These several rocks are mingled in almost inextricable confusion. The trap continually breaks through the older rocks, and especially the sandstones, and overlies them in vast swelling and spreading masses. The tops of many of the hills are expanded surfaces of bare trap-rock, scattered with huge stones of the same material, seemingly separated from the general mass in a semi-plastic state, and not water-worn.

The Klip River (Stone River) takes its name from passing through stony districts of this character. The sandstones are continually fissured, and grooved through by the rivers. Some of them are of the old large-grained Silurian type, in very large masses; others have the character of excellent building freestones. The peculiar table-mountains, so well known as characteristic of the South African districts, are vast tables of Silurian sandstone, 400 or 500 feet thick, and 3 or 4 miles broad, reared up on buttresses of granite or gneiss, which slope out from beneath the tables as grass-covered ridges. The perpendicular faces of the sandstone tables are bare, horizontally-ledged rock, which lights up very brilliantly in the rays of the declining sun. These table-mountains look down into grand ravines and valleys many hundred feet deep, with a silver streak winding away in sight for miles at the bottom. They are, however, portions of the general system of ridges, slightly notched out, or perhaps somewhat reared, from the rest of the range. This is well illustrated in the case of the very beautiful Table Mountain which is visible from the city of Maritzburg towards the east. This Table Mountain is simply the termination of one of the subordinate fingers which comes down from the Giant's Castle through the Spijoenkop, and through the fine range of hills looking down upon Maritzburg from the north, lying in the fork where the Umgeni River, which lies to the north of this range, is joined by its tributary, the Umsundusi, the river of the city of Maritzburg.

The surface of the rock foundations of the land, the granites, traps, and sandstones, are in very many places masked and veneered by shales, which, in some instances, almost pass into the condition of true slate. The hardened muds of the old formation are in their turn disintegrated by the agency of the atmosphere, and of most energetic vegetable life, and so transmuted into more or less fertile surface soil, not unfrequently rich in humus. The shales are in general use for building, especially for the construction of foundations laid beneath the ground.

As a general rule, the granites and gneiss occur most frequently within 40 or 50 miles of the coast, and shales and fossiliferous sandstones, perforated and overlaid by trap, are most abundant in the northern districts, and especially in the basin of the Tugela. A species of amygdaloid or claystone porphyry is also not unfrequently associated with the granites, gneiss, and Silurian sandstones.

True limestone is very rare in Natal. It has been found in large continuous masses beneath the soil in one or two places, as for instance near the sources of the Blau Kranz, in the county of Weenen. But within the last few months a very magnificent bed of crystalline limestone, in places almost rivalling Carrara marble in excellence, has been discovered on the River Umzimkulu, partly in the new Alfred county, and partly in Alexandra county, and within half-a-dozen miles of the sea. This mass is estimated to cover an area of 20 square miles in extent; and at one spot the river passes beneath a precipitous wall of white marble 1000 feet high.

There are very large deposits of fine bituminous coal in the great basin of the Tugela. This coal has been seen on the surface in many places where the channels of the rivers are cut through it; and the waggoners stop as they pass, and fill a few sacks to take away with them and sell to the blacksmiths in the towns. The beds are of considerable thickness; but the actual extent of the coal, and the connexion of the several masses, has not been yet determined. Carboniferous shales, with quite the lustre and aspect of coal, and easily made red hot by a strong air-blast, crop out in other places, as in the Umvoti, and on the coast on the Umhlali, 40 miles to the north-east of Durban. Ironstone of various qualities is very abundant in all directions. It is dug out in nodular masses of from 1 to 3 feet across from beneath the surface-soil of most of the gardens in Maritzburg. An ore found in Umvoti county, almost malleable in its crude state, has been known to the Kaffirs for a very long period, and rudely worked by them. Fine ores of copper have been also recently discovered near and beyond the south-west frontier.

The coast of Natal is for the most part rock-bound. Granite, sandstone, trap, and basalt, alternate with each other in furnishing provocation to the surge. In places stretches of fine compact sand alternate with the rocks. Near the mouth of the Umzimkulu there is a very beautiful tract of columnar basalt exposed upon the beach. Further south, in No-man's-land (now Alfred county), there is one region where the granite rocks closely resemble the rocks of the Island of Jersey. They are of great diversity of colour, and intersected by walls of black basalt, and present a very bright and beautiful appearance when the sea-spray is breaking over them in the almost tropical sunshine. The sandstone rocks are commonly scooped into hollows and basins, which are kept filled by the sea-spray, and thickly inhabited by pigmy editions of all kinds of shelled Molluscs,—*Cypreæ*, *Neritæ*, *Volutes*, *Trochuses*, *Murices*, and the rest. At the extreme south-western boundary of the colony, near the mouth of the Umtamfume, and more particularly between it and the Umzimba, the second river beyond, there is a remarkable fossiliferous bed laden with Ammonites, *Trigonia*, *Terebra*, a large Univalve allied to the Chemnitzia, and containing Brobdignagian Muscles, probably of the genus *Pinna*, between 2 and 3 feet long. It is quite impossible to get these muscles out from the matrix. They can only be seen *in situ*, in caves that have been washed out by the breakers in the sea-cliff. The hinge-mass has a transversely laminated structure, like that of the *Inoceramus* of the chalk. At low water a large pavement, studded with these fossils, is exposed along the beach. The rock is a limestone, seemingly of the Oolitic period.

The inner bay of Natal is one of the most interesting possessions of the young colony, and is remarkable as being the only land-locked harbour along many hundred miles of inhospitable coast. It is a shallow tidal basin, about 4 miles long, with deep water-channels, and sheltered to the south-west by a grand bluff and hill-range above 200 feet high, and to the south-east by a low dune of blown sand, which is there thrown up along the sea-beach from the entrance of the bay to the mouth of the River Umgeni, a distance of about 4 miles. The Bluff-range itself has obviously at some former time been an outlying island, as it subsides entirely towards the River Umlazi, and leaves there a tolerably broad sea-gap. The Bluff-point and the Sand-spit approach each other from opposite sides at a broad angle, and leave between them a water-channel into the inner bay, which is encumbered by a shifting sand-bar. Two small insignificant streams of fresh water drain into the bay. The scour is mainly due to the influx and efflux of the sea, and to the large area of the basin. The tide rises and falls 6 feet, and a considerable portion of the bay is dry at low water. The ships lie at anchor in a deep channel just within the protection of the Bluff. Ships of 500 and 600 tons' burthen enter easily at times of high tide; but the bar is subject to alternate fits of kindliness and ill-humour. Works, under a plan of Captain Vetch's, were commenced some time since to enclose the seat of this bar in a large outer basin formed of wooden frames laden with stone. One of the piers now stretches out about a third of a mile into the sea; but the works are in a state of temporary suspense, on account of a difficulty with the contractor.

The interesting point, physico-geographically, in connexion with this bay is that it is altogether an external appendage, and, so to speak, after-thought of Nature. Inland of the basin there is a fine range of bush-covered hills (the Berea), 360 feet high. This is obviously the old and proper line of coast, continuous with the rest of the coast northwards. But the coast-hills from the south (the Bluff Hills) stand out further to seaward, and overlap this, so that a gap, quite open to the north-east, is left between. A ship in the north-east, 3 miles out to sea, off the mouth of the Umgeni, looking south-westwards, would have the mouth of an open valley formed by the Berea Hills on the right hand, and the Bluff Hills on the left hand, before it. The mouth of this valley has been barred by blown sand, except just under the point of the Bluff, and even there the bar is continued under water. The space within and between the two hill-ranges is now partly shallow water, and partly a dry sand-flat, raised about 20 feet above the level of high water. The sand-flat is the little plain upon which the town of Durban has been built, and the water is the land-locked harbour or inner bay. The drifting along of the sand in the sea-currents, the rolling of the breakers, and the overlapping position of the Bluff Headland, have gradually issued in the formation of this harbour, with its low sandy outworks and barriers.

Thus, then, the colony of Natal is, in the main, an inclined slope of land 150 miles long, with a gradient of 1 in 70, looking out to the sunny Indian Ocean, in parallels of south latitude nearly tropical. The rapid slope and considerable elevation of portions of the land confer upon it diversities of climate that enable the productions of temperate and tropical regions of the earth to be successfully reared. But this does not complete all that has to be recorded in praise of its climate. Another consequence follows from the arrangement of this land-slope, looking out to the Indian Ocean in nearly tropical parallels; the fact, namely, that the land is abundantly supplied with water, and that the greater part of this abundance falls in the season of summer, rather than in the season of winter. The streams of Natal never dry up, but they are swollen during the period of greatest heat; and at their lowest during that of greatest cold. The summer in Natal is a season of frequent heavy rain, and still more frequent cloud; hence the heat never assumes the almost tropical fierceness which it would otherwise do in such close neighbourhood to the tropics. The summer heat is tempered by cloud-screens and constant evaporation. The winter in Natal is a season of almost constant genial and June-like sunshine. This is exactly the opposite of what obtains at the Cape of Good Hope. The summer there is the season of scorching and drying heats, and the winter the season of wetness and cold. The reason for this remarkable and beneficent peculiarity has now to be explained, and the peculiarity itself followed out in detail by the light of deductions made from eight years' close and incessant study of the meteorology of Maritzburg.

Natal lies in a region of the earth that is naturally within the influence of the great south-eastern trade-wind set of the atmosphere for at least a considerable portion of the year. But this natural inclination of the air to move from the ocean to the land is greatly reinforced on the coast of Natal by another agency, which is yet more constant and more powerful. The nearly vertical sunshine falls upon the land-slope for the greater part of the year, with a force that rapidly heats the superimposed air, and expands as it heats, until the thin air is driven back before the advancing stream of heavier atmosphere that flows forward from the comparatively cool surface of the Indian Ocean. This deduction is not a matter of hypothesis. It is a result of direct observation. For instance, during 1095 evenly spread observations made at Maritzburg last year, the wind was blowing *in* from the sea 820 times, and *out* to the sea 145 times.

Now, when the sea wind comes in upon Natal from the broad sweep of the Indian Ocean, it is necessarily laden with pretty nearly as much invisible vapour as it can carry. With this burthen it rushes along upon the land, and as it rushes it glides up and up the slope which has been described. Before long it has made an inland journey of 70 miles, and is 1 mile high. It then finds itself freed from about a sixth part of the load and downward pressure which it sustained at the sea-level. Being freed from this pressure it expands, and becomes intrinsically rarer; and being rarer, it is incapable of supporting its original burden of vapour. Accordingly, the vapour first gathers as mist, then thickens as cloud, and finally deposits as rain; the deposit being accompanied by electrical disturbance and thunder. After a time this disturbance so drains the air of its superfluous moisture that the atmosphere clears, and the sunshine resumes its fervent sway; when the same state of affairs is brought back, and the same course is again entered upon.

Maritzburg, the capital of the colony, stands about two-fifths of the way up the slope, 40 miles in a direct line from the sea, and 2000 feet high. The observatory at which the meteorological observations were made is placed in 29° 36′ 13″ S. latitude; and 30° 1′ 34·5″ E. longitude, and is 2095·674 feet above the Custom House at Durban, which is just above the high-water level of the sea. In Maritzburg 40 thunderstorms occur during the six hottest months of the year; and lightning, indicative of a thunderstorm near at hand, is seen on ten other days. Thus, during this season of greatest heat there are thunderstorms on nearly each third day; and during a considerable part of the season there is rainfall on each second day. It is thus that summer heat in Natal is so remarkably tempered by the combined influence of the cloud-screen and the frequent watering. Almost every day in summer gets cloudy soon after noon, and the clouds continue to shroud the sky and screen the ground until far into the night, when the sky clears, and the stars come forth. Unless on the exceptional occasions, to be hereafter alluded to, when the hot land-wind blows in force, the summer temperature of Maritzburg does not rise above 84° or 85° of Fahrenheit's heat-scale. In the last year there were only twelve days on which the temperature rose above 90°.

The highest, the mean, and the lowest temperatures of each month for the six hottest months of the year, deduced from observations through a period of eight consecutive years terminating with 1865, were:—

	Highest.	Mean.	Lowest.
October	96·0°	66·6°	45·2°
November ..	97·2	67·1	45·2
December ..	97·6	70·4	52·2
January	93·0	71·4	51·8
February ..	97·1	71·8	55·8
March	92·8	69·7	42·0

It will be observed here that, although the extreme temperatures are liable to occur in any of these months, the mean of any one month never rises to 72°; and that the range of the mean for these six months scarcely exceeds 5 degrees. The mean temperature for the six summer months is 69·5°. The night temperature in these months rarely descends to 52°, and never goes below 42°.

In the winter months the sun shines with less intensity upon the land, and consequently the monsoon air-currents and the atmospheric up-cast are less violent. A steady sea-wind blows; but this wind is more rarely broken by thunderstorms. Only ten thunderstorms occur in Maritzburg in the six winter months of the year, and these fall at the beginning and end of the season, which must be looked upon as periods of transition. It hence happens that as *the summer* is the season of frequent cloud and thunderstorm, *the winter* is the season of comparatively unbroken sunshine. In the last year there were at Maritzburg only twenty-one days of unbroken cloud during the six months of winter, and there were forty-nine in which the sunshine was uninterrupted through the day, the rest of the time being days on which sunshine greatly preponderated over cloud. The rule in winter is that the sun breaks forth in splendour soon after its rising, if it be not clear from the horizon, and that the temperature mounts rapidly to somewhere between 70° and 80°, so that only light clothing can be worn in the midday of even this period. The temperature then falls so low in the evening, and at night, as to make a wood-fire pleasant, although not indispensable, to healthy and hardy men. On the coast a fire is not lit, excepting for cooking, all the year round; and, in many places in the uplands, people who have stirring occupations never think of a fire in their sitting apartments. Indeed, the rule in the colony still is to build rooms without fireplaces; although this is a rule which will certainly be departed from as the settlers grow more wealthy. In journeying at this season the traveller rolls himself up in his tented waggon, at dark, in blankets, and rises at the first dawn of day to find himself warmed genially at Nature's own fire, by the time his open-air toilet and his first arrangements for the business of the day are completed. The fresh cool daybreak under canvas and the early basking in the first slant rays of the rising sun, at the tent door, are certainly among the prominent delights of a Natal residence.

The highest, the mean, and the lowest temperatures of each month for the six coldest months of the year, deduced from the observations of eight consecutive years, were:—

	Highest.	Mean.	Lowest.
April	89·5°	64·8°	40·2°
May	85·2	59·3	35·4
June	78·2	55·2	32·0
July	82·2	55·2	29·0
August	89·8	59·7	34·8
September	95·4	65·1	38·0

It will be observed here that there is no month in the winter in which the temperature is not liable to rise to 78°, and that the range of the mean of these six months extends to nearly 10°. The mean temperature of the coldest month is above 55°. The mean temperature for the six winter months is 59·9°. On the severest nights the temperature only just dips below the freezing-point. In a period of eight years the temperature at

Maritzburg has only been five times below freezing, and three of these five occurred on three consecutive nights in the month of July, 1864. In the last year there were only eight days during the six winter months on which the temperature did not rise to 60°; only twenty-three nights on which the temperature fell below 40°, and only two nights on which it fell to 36°.

One direct consequence of this coincidence in Natal of the period of greatest heat with the period of greatest moisture is the wonderful luxuriance with which the land is clothed. As the visitor sails along the coast from the Cape to Natal, he finds himself suddenly entering a new region of greenness. The impression made on the Cape colonist, when he first visits Natal, is almost invariably akin to that which is experienced on going suddenly into a well-kept garden. The same feeling is awakened in a degree even on crossing the Umzimkulu, near the coast, into the old territory of Natal.

The extreme range of temperature, during eight years, was limited to 68·60°. There is considerable vicissitude, and to this vicissitude, indeed, much of the healthiness of the climate is due. The frequent relief from great heat makes the general high range of temperature much more endurable than it would otherwise be. The change also introduces an element which may become harmful under certain circumstances, that, namely, of chill after exposure of the living frame to a high temperature. Most sicknesses in Natal occur in the cold period following on great heat. I have no doubt that the so-called Natal sores are produced by the depressing influence of chill, operating upon cutaneous capillaries that have been exhausted by long sustained stimulation. It is a common remark that illness among cattle is apt to be produced by what are called sea-rains. Now these occasional sea-rains are invariably connected with cold gales blowing in from the ocean. These rains are not ordinarily heavy on the uplands, but they are chilling. It is not unworthy of remark that this cause of mischief is one which can be largely guarded against by care, intelligence, and good management. Protection from chill consequent upon sudden depression of temperature is an affair that comes quite within the domain of art; the chill can be avoided by warm clothing, well-regulated exercise, comfortable dwellings, artificial fires, and the various expedients that act upon live stock in the same direction. Sudden cold is more easily obviated than long continued heat.

The large vicissitude of temperature tells differently at the opposite seasons of the year. In the summer season the *daily range* of temperature is comparatively small, and the vicissitude lies between day and day. In the winter season the *daily range* is comparatively large, and the vicissitude lies between day and night. This is a natural result of the cloudiness of the summer day and of the sunniness of the winter day. The cloud keeps the day temperature from rising so much above the night temperature as it would otherwise do in the summer-time. The sun, on the other hand, in winter lifts the day temperature far above the night temperature. This is singularly and strikingly illustrated when the temperatures are laid down as zones upon paper. The winter zone is a broad even sweep, with very slight irregularity of outline. The summer zone is a narrow belt broken up everywhere into Alpine peaks and intervening abysses.

The mean temperature of Maritzburg, for a period of eight years, is 64·71° ; the mean highest temperature of the year, for this period, is 95·60° ; and the mean lowest temperature of the year 33·10°. The highest temperature that occurred in this period was 97·60°, and the lowest temperature 29·00°. The mean temperature of the coast-district is about 3·5 degrees higher than the mean temperature of Maritzburg ; but this district experiences less extremes of both heat and cold. Its climate is more equable ; it is indeed semi-insular, and approaches in a small degree towards the climate of the Mauritius. The impression made on going from the uplands to the coast is somewhat like that which is experienced on entering a warm and moist conservatory.

The rainfall at Maritzburg is very nearly the same as the rainfall of London. The mean fall for a period of eight years was 30·11 inches. The greatest yearly fall, during this period, was 37·31 inches; this fall, however, is not so evenly spread over the entire year as in England. The fall takes place principally in the six hot months that lie between September and April. There are two mid-winter months (June and July) in which only seven-tenths of an inch of rain falls for the month, that fall being distributed into three days and a half. For the two months before, and the two months after June and July, the fall is 1·4 inches distributed into 8¾ days. During the six summer months 4 inches per month fall, and the fall is distributed into 15½ days : thus 24 inches out of the entire 30, or four-fifths of the whole quantity, fall during the summer half of the year.

During the comparatively dry season of winter the dews are frequent and heavy on the uplands; hence the water-courses do not dry up. The rivers and streams run all the year; but the water is low in winter, so that horsemen can ride and waggons be driven through every stream that is encountered. Even the large Tugela, nearly two-thirds of a mile wide, is then fordable near its mouth. In the summer season the water is deep in most of the rivers, so that they are impassable otherwise than by bridges, boats, or swimming. On the whole, on account of the broken distribution of the land and the general set of the air-currents, the land is wonderfully well watered. There is scarcely a spot in the colony, excepting on the very hill-tops, to which water may not be led by a little contrivance.

The rainfall on the coast-districts is about one-half as much again as at Maritzburg; this is chiefly due to the sea-rains being heavy on the coast, and comparatively light on the uplands. On the higher hill-tops these sea-rains become merely heavy mists. In the month of June, last year, I was caught by a sea-rain between two small rivers on the coast, and detained by the flood seven days, and then finally gave up the attempt to push onward over the swollen and dangerous streams, and made my way home to Maritzburg along one of the main ridges of watershed. The rainfall on the coast during these seven days amounted to 9¼ inches, 2 inches falling within twenty-four hours on two occasions. The fall at my observatory at Maritzburg, for the same period, about 40 miles from the coast and 2000 miles high, was a trifle over one inch and a quarter! Falls of this extreme character are fortunately comparatively rare; a much more serious, and, indeed, disastrous one occurred in the month of April of the year 1857. It is said that 27 inches of rain fell at Durban, and between 10 and 11 inches at Maritzburg, between the fourteenth and sixteenth days of the month. I was not in the colony at that time, and cannot vouch for the accuracy of this estimate; but, at any rate, there is no doubt that the Umgeni River rose 28 feet above its usual level near its mouth, and burst quite across the sandflats, described in a previous page as the site on which Durban stands, to the Inner Bay. The water was at one time within 12 feet of the level of the principal street of the town. The Tongaati River rose 30 feet above its usual level. The Umvoti River rose 16 feet, and spread a bed of sand 4 feet deep over the neighbouring pastures. Even the Maritzburg river, the Umsundusi, where the fall was so much less, carried away its bridge, and cut off the communication between the city and the port for several days. The sea-beach was covered by trunks of trees and beds of reeds, brought down by the rivers; 200 dead oxen were counted at one place on the beach, within a distance of 10 miles. The thunderstorm-rains of the summer season are commonly heavier on the uplands than on the coast. This is well marked at the elevation of Maritzburg, and is still more notable at greater heights.

The days and amount of rainfall at Maritzburg for the several months of the year, expressed in an average deduced from observations of eight years, are—

	Rainfall, in inches and tenths.	Days on which Rain fell.
January	3·92	16
February	4·41	14
March	3·29	13
April	1·44	9
May	0·95	3
June	0·26	1
July	0·23	2
August	0·14	5
September	1·32	8
October	3·60	17
November	4·58	17
December	5·04	18

The actual rainfall at Maritzburg for eight years was—

	Inches and tenths.
1858	27·42
1859	28·40
1860	30·60
1861	22·41
1862	29·97
1863	34·66
1864	37·31
1865	31·08
Sum total for eight years	241·85 inches, or 20 feet.

The mean humidity of the air at Maritzburg at nine in the morning, deduced from a period of eight years, was 71·2° (100° representing saturation). At three in the afternoon it was 60·1°; and at nine in the evening 83·4°. The mean humidity for the year was 70·8°.

The mean height of the barometric column at Maritzburg, deduced from observations during a period of eight years, was 27·891 inches. A mean of a comparison of eighty sets of observations by standard barometers gives 2095·674 feet as the height of the observatory above the Custom House at Durban, which is near the high-water level; the exact position of the observatory being 29° 36′ 13″ of S. lat., and 30° 1′ 34″ E. long. The highest reading during eight years was 28·474 inches, and the lowest reading 27·215; the extreme range for this period being therefore 1·259 inches. The mean yearly range for the period of eight years is 0·991 of an inch. There is a constant daily rise and fall, the greatest fall occurring two or three hours after noon, and the mean daily range of this rise and fall being 0·078 of an inch. This daily fluctuation is of course dependent on the direct influence of the sun. The sun rarefies and lightens the air every day as it shines down on the earth's surface from a high elevation.

Within the limits which have been thus named the barometric column is in a state of incessant movement. This is immediately seen when the successive heights are laid down in curved lines upon paper. There are little daily billows in the line, the troughs between the billows corresponding with the early afternoon hours of the day. But there are also large waves, varying in number between four and seven in each month. There can be no doubt that this succession of large waves is due to a constant and recurrent reversal of the set of the atmosphere. When the general movement of the mass of the air is from south to north the barometric column is pressed up, and when the general movement is from north to south the barometric column falls. The direction of this main movement is not always indicated correctly by vanes, because there are frequently local currents produced on the actual surface which conceal and mask the larger movement. Occasionally the southward movement of the air is developed along the surface in its full intensity. There then occurs what is known in Natal as the "hot wind." This wind begins to blow from the north-west in the early morning with extreme violence, and continues in great force until noon or the early afternoon, when it suddenly lulls, and is followed by a fresh sea-breeze. During its continuance the barometric column falls, and the temperature rises to somewhere between 86° and 97°. The air becomes so parching and dry that living plants shrivel, and articles of furniture shrink and crack. In extreme cases the moisture of the air sinks even below 33°. This wind is almost always followed by a thunder-storm. It is somewhat remarkable that this wind scarcely ever extends quite to the sea-coast. It rushes down some distance beyond the parallel of Maritzburg, and then encounters the sea-breeze in its full strength and in some way glides up above it. When the hot wind is blowing in full force at Maritzburg there is generally a much gentler breeze setting more or less along the coast at Durban, and a temperature some 7° or 8° cooler.

The hot wind blows at Maritzburg upon an average 25 times in the year. It is liable to occur in every month of the year; and when its recurrence is watched through a brief period, it does not seem possible to connect it with any certain condition or law. But when it is noted for a longer time it becomes clearly apparent that it is intimately connected with the seasonal position of the sun. This is strikingly illustrated when the mean frequency of its recurrence in the several months of the year for a period of eight consecutive years is numerically expressed. For the last eight years this frequency stands in the following ratio:—

	Mean for eight years.
January	1·3
February	1·2
March	0·7
April	0·8
May	1·2
June	0·8
July	2·3
August	3·2
September	5·1
October	4·2
November	3·0
December	1·7

It will be seen, from this deduction, that September is the great month for the hot wind, and that it prevails more and more frequently in the two months that precede September, and with diminishing frequency in the two months that follow September; and that it is of comparative rarity in the other months of the year. It may be looked for about once in the months of January, February, March, April, May, and June; about twice in the months of July and December; about three times in August and November; four times in October; and five times in September.

The violent hot wind of Natal is clearly connected with the winter gale of the South Atlantic that so frequently works devastation in the neighbourhood of the Cape of Good Hope. On the 17th day of the month of May last year (1865) a furious north-west gale burst upon Table Bay, and destroyed a considerable number of ships. The mail steam-ship *Athens* was driven upon the rocks in making the attempt to steam out to sea from the bay, and lost, with every living soul on board. Now the approach of this gale was indicated at Maritzburg by the movements of the barometer six days before, and during the height of the storm a fierce hot wind was blowing in Natal. On the morning of the 11th of the month the barometer was standing at 28 inches and a tenth; from this it fell during eight successive days until it was depressed to 27 inches and seven-tenths. It then rose suddenly and rapidly for three days until it reached nearly to 28 inches and four-tenths. There was thus a great atmospheric hollow or furrow 11 days broad, and at the instant of the greatest depression of this furrow there was a north-west gale blowing at Table Bay and a hot wind blowing at Maritzburg. The crisis of the gale took place about twenty hours later at Maritzburg than at Table Bay; that is to say, the focus of the disturbance required so long to travel from the meridian of Table Bay to the meridian of Maritzburg, a distance of 800 miles in round numbers. The temperature rose at Maritzburg during the crisis of the gale to 85°, although it was near the period of mid-winter. The wind was from the south-east at the beginning of the barometric depression. On the 15th it veered from south-east to north-east, then passed to south-west, and back to north-east. On the 16th it was blowing strong from the north-west, then passed to south-west and south-east, and on the 18th again burst into fierce north-west with the lowest dip of the barometric depression; after this it veered through north-east and north to east as the mercurial column rose. The sudden and violent reversals of the air-current about the period of the height of the gale conferred somewhat the character of the cyclone upon it; but my own impression is that these turbulent hot winds are rather manifestations of one of the great forces that underlie the whirlwind than the whirlwind itself. I take it to be the sudden transference of what is normally the upper current of the atmosphere in mass to the lower regions near to the earth's surface, and I should look for the true whirlwind, not in the mass of the southward flowing air, but in the margins of the antagonistic streams where they come into direct conflict. The heat and dryness are in all probability the accidental results of this south-eastward flowing wind having been primarily fed from the hot and arid regions of Equinoctial Africa. In the South Atlantic the same current is fed from the broad spaces of the Equinoctial Ocean.

The winter rains occur with the high crests of the barometric waves. The thunder-storms and summer rains with the depressions of the waves, and the hot winds with the greatest depressions. Thus, rain falls in Natal with both high and low barometer. The thunder-storms burst just when the barometric column begins to rise after the lowest hollow of the depression.

The thunder-storms in Natal are of great intensity, but of brief duration. Clouds gather over the hill-tops, and then spread rapidly out into the valleys. The storm for the most part breaks first in the hills, and then moves rapidly off towards the east, giving three or four near discharges in rapid succession as it passes, and then making the rest of its display with increasing distance. The lightning is often of exceeding beauty, the track of the discharge not unfrequently being seen upon the background of the cloud as a broad quivering ribbon. Parabolloid and elliptical discharges amidst the clouds, with descending or radiating lines setting off from them, are not unusual. Occasionally very interesting streams of horizontal discharge are seen running through the cloud-caps of the Table

Mountains just parallel with and above their flat tops. The colour of the lightning is very various. It is sometimes of a bright rose tint; sometimes of the hue of pink topaz; sometimes amethyst; sometimes orange; sometimes pale blue; sometimes pearly white; and occasionally of a dead leaden tinge. When a storm occurs towards evening the horizon is illuminated for some hours after dark by incessant flashing. The end of the vast storm-cloud is brought out in deep relief at each discharge by glows of electric light bursting forth from behind its edge, the foldings and twistings of which are rendered conspicuous by lines and sheets of coloured fire. I have seen displays of this character taking place simultaneously on six different points of the horizon, and continuing for hours at a stretch, and I have counted fifty-six flashes in the minute. Accidents of course happen sometimes from the violence of these discharges. Kafirs and animals are occasionally killed. The death of European settlers is comparatively rare, for the double reason that they are much more sparsely scattered over the open country, and that their houses are generally protected by lightning-rods. The town of Maritzburg is now so abundantly protected with rods that accidents within its precincts are of very uncommon occurrence. I have only known two or three chimney-tops struck, and some half-dozen blue-gum trees shattered, during nine years. In the open country considerable numbers of oxen huddled together in the storm are sometimes killed at once. The popular notion is that the discharge runs through the beasts in succession. My own impression, derived from the appearance of the ground where such accidents have taken place, is that the discharge acts at one blow over the entire area covered by the cattle, and divides itself among them. The heaviest rainfall that I have seen during a thunder-storm has been about an inch and a half. I once only measured an inch within the hour. The heaviest fall I have known to take place within 24 hours was 3 inches.

Very heavy hail-storms occasionally happen in connection with the thunder-storms. The hail, for the most part, sweeps on in the midst of a tornado, a distinct drone, or hum, being heard to herald its approach for one minute, or even two minutes, before it arrives. Hailstones as large as pigeons' eggs are sometimes seen. Masses of ice weighing three-quarters of a pound have in rare instances been noticed. The fall of the hail is always limited to a comparatively narrow zone. The path of the hail-storm is accurately marked out over the country by a long narrow line of devastation.